intake system into the evaporative fuel processing system under predetermined conditions after the pressure reduction at the pressure reduction step in order to further reduce the pressure within the evaporative fuel processing system; and

a leakage determination step of determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system is higher than a predetermined leakage reference value.

REMARKS

The Office Action dated December 12, 2002 has been received and carefully noted. The period for response having been extended from March 12, 2003 to April 14, 2003, by the attached Petition for Extension of Time, the above amendments and the following remarks are submitted as a full and complete response thereto.

Independent claims 1 and 4 have been amended. Applicants submit that no new matter has been added by the amendments made herein. Therefore, claims 1-6 are pending in the present application, and Applicants respectfully submit claims 1, 2, 4 and 5 for reconsideration.

As a preliminary matter, the Office Action noted that the amendment filed November 12, 2002 was objected to under 35 U.S.C. § 132 since it introduced new matter into the disclosure. In particular, the Office Action noted that "the disclosure does not recite that the 'predetermined negative pressure' or 'second predetermined negative pressure' are any different and in fact the figures indicate they are both equal to POBJ".

Claims 1 and 4 have been amended. Applicants submit that the amendments made

to claims 1 and 4 render the new matter objection moot, and therefore submit that the claims are in compliance with U.S. patent practice.

Claims 1, 2, 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Busato et al. (U.S. Patent No. 5,957,115, herein after "Busato") in view of Matsumoto et al. (U.S. Patent No. 5,750,888, herein after "Matsumoto"). Applicants respectfully submit that each of claims 1, 2, 4 and 5 recite subject matter which is neither disclosed nor suggested in the cited prior art.

Claim 1 recites a leakage determination system for an evaporative fuel processing system that causes a canister to absorb evaporative fuel generated from a fuel tank and supplies the evaporative fuel absorbed in the canister to an intake system of an internal combustion engine. The leakage determination system includes a pressure detection means for detecting pressure within the evaporative fuel processing system, a pressure reduction means for reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a predetermined negative pressure, by introducing negative pressure from the intake system, and a negative pressure introduction means for introducing the negative pressure from the intake system into the evaporative fuel processing system under predetermined conditions after the pressure reduction by the pressure reduction means in order to further reduce the pressure within the evaporative fuel processing system. The leakage determination system further includes a leakage determination means for determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system by the negative pressure introduction means is higher than a predetermined leakage reference value.

Claim 4 recites a leakage determination method for an evaporative fuel processing system that causes a canister to absorb evaporative fuel generated from a fuel tank and supplies the evaporative fuel absorbed in the canister to an intake system of an internal combustion engine. The leakage determination method includes a pressure detection step of detecting pressure within the evaporative fuel processing system, a pressure reduction step of reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a predetermined negative pressure, by introducing negative pressure from the intake system, and a negative pressure introduction step of introducing the negative pressure from the intake system into the evaporative fuel processing system under predetermined conditions after the pressure reduction at the pressure reduction step in order to further reduce the pressure within the evaporative fuel processing system. In addition, the leakage determination method includes a leakage determination step of determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system is higher than a predetermined leakage reference value.

Accordingly, the present invention provides a leakage determination system for an evaporative fuel processing system of an internal combustion engine, whereby the leakage determination system results in the advantage of performing an accurate leakage determination by eliminating the influence of the temporary rise in the pressure within the evaporative fuel processing system.

Therefore, it is respectfully submitted that the prior art fails to disclose or suggest at least the elements of a "leakage determination means for determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the

introduction of the negative pressure from the intake system by said negative pressure introduction means is higher than a predetermined leakage reference value", and "a leakage determination step of determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system is higher than a predetermined leakage reference value," and therefore fails to provide the advantages which are provided by the present invention.

Busato is directed to a pulse interval leak detection system. Busato discloses an emission control system comprising a vapor collection canister a canister purge solenoid valve connected in series between a fuel tank and an intake manifold of an internal combustion engine. Busato also discloses a pressure sensor for sensing pressure in the evaporative emission space. More specifically, Busato discloses a system for providing a signal representing pressure (either positive or negative) by controlling and monitoring valves and sensors so that a leak can be detected.

Matsumoto discloses a fault diagnostic method and apparatus for fuel evaporative emission control system. The fuel evaporative emission of Matsumoto is admitted from a fuel tank and adsorbed by a canister and is separated from the canister by purge air and sucked into a suction passage of an engine. The fault diagnostic apparatus fluid-tightly closes the fuel tank such that a vacuum is held in the fuel tank, and then detect the presence of a leak in a fuel evaporative emission flow path on the basis of a rate of increase of the pressure in the fuel tank. At the same time, the average value of the pressure in the fuel tank is calculated at regular intervals, and the calculated average value is compared with levels of the pressure in the tank detected within a predetermined period

of time, so that the detection of the leak is interrupted depending upon the result of the comparison.

Applicants respectfully submits that each and every element recited within claims 1 and 4 of the present application is neither disclosed nor suggested by Busato and/or Matsumoto, taken alone or in combination. In particular, Applicants submit that the leakage determination system and method, for an evaporative fuel processing system that causes a canister to absorb evaporative fuel generated from a fuel tank and supplies the evaporative fuel absorbed in the canister to an intake system of an internal combustion engine as recited in the present application is clearly distinct from that which is illustrated in the cited prior art. Specifically, it is submitted that neither Busato nor Matsumoto, taken alone or in combination, disclose or suggest at least the limitations of a leakage determination means for determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system by said negative pressure introduction means is higher than a predetermined leakage reference value, and a leakage determination step of determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system is higher than a predetermined leakage reference value.

According to the present invention, negative pressure is further introduced into the evaporative fuel processing system after reducing the pressure within the evaporative fuel processing system up to the predetermined negative pressure. In addition, leakage determination is carried out based on the pressure within the evaporative fuel processing system detected during the introduction of the negative pressure. Given the above, the

advantages of carrying out leakage determination while reducing the temporary rise in the pressure can be obtained.

In other words, since the pressure within the evaporative fuel processing system of the present invention is detected while introducing the negative pressure as described above, the detected pressure represents an offset between an increment of a pressure increased by leakage and a decrement of the same reduced by the introduction of the negative pressure. For this reason, even when the pressure within the evaporative fuel processing system of the present invention is temporarily increased (e.g., due to an increase in the amount of evaporative fuel generated in the fuel tank), it is possible to carry out leakage determination while reducing the temporary rise in the pressure. Consequently, the influence of the temporary rise in the pressure caused by other factors than leakage on the leakage determination can be eliminated while enabling accurate leakage determination.

In contrast, Applicants submit that Busato and/or Matsumoto shows a leakage determination that is carried out based on the pressure within the evaporative fuel processing system detected in a state where the evaporative fuel processing system is closed after reducing the pressure within the evaporative fuel processing system up to the predetermined negative pressure, rather than a leakage determination means for determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system by said negative pressure introduction means is higher than a predetermined leakage reference value as recited in the present application. Thus, it is submitted that Busato and/or Matusmoto fails to disclose or suggest each and every element recited in

the cited prior art.

As for claims 2 and 5, Applicants submit that each of claims 2 and 5 recite subject matter which is neither disclosed nor suggested by the prior art. In particular, each of claims 2 and 5 depends on claims 1 and 4, respectively. Therefore, each of claims 2 and 5 incorporates each and every limitation recited within claims 1 and 4, respectively therein. Accordingly, Applicants submit that each of claims 2 and 5 also recite subject matter which is neither disclosed nor suggested by Busato and/or Matsumoto for at least the reasons set forth above with respect to claims 1 and 4.

In view of the above, Applicants respectfully submit that claims 1, 2, 4 and 5, each recites subject matter that is neither disclosed nor suggested in the cited prior art. Applicants also submit that the subject matter is more than sufficient to render the claims non-obvious to a person of ordinary skill in the art, and therefore respectfully request that claims 1-6 be found allowable and that this application be passed to issue.

Should the Examiner believe the application is not in condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below to arrange for an interview to expedite this application.

In the event this paper is not considered to be timely filed, Applicants respectfully petition for an appropriate extension of time. The Commissioner is authorized to charge payment for any additional fees which may be required with respect to this paper to Counsel's Deposit Account 01-2300 referring to Attorney Docket No. 108419-00020.

Respectfully submitted,

Arent Fox Kintner Plotkin & Kahn

Sam Huang
Attorney for Applicant
Reg. No. 48,430

Customer No. 004372
1050 Connecticut Ave. NW
Suite 400
Washington, D.C. 20036-5339
Tel: (202) 857-6261
Fax: (202) 638-4810

CMM/SH/bgk

Enclosure: Marked-up Copy of the Claims
Petition for Extension of Time

MARKED-UP COPY OF THE CLAIMS

1. (Twice Amended) A leakage determination system for an evaporative fuel processing system that causes a canister to absorb evaporative fuel generated from a fuel tank and supplies the evaporative fuel absorbed in the canister to an intake system of an internal combustion engine,

the leakage determination system comprising:

pressure detection means for detecting pressure within the evaporative fuel processing system;

pressure reduction means for reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a [first] predetermined negative pressure, by introducing negative pressure from the intake system;

negative pressure introduction means for [further reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a second predetermined negative pressure lower than said first predetermined negative pressure, by] introducing the negative pressure from the intake system into the evaporative fuel processing system under predetermined conditions after the pressure reduction by said pressure reduction means in order to further reduce the pressure within the evaporative fuel processing system; and

leakage determination means for determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system by said negative pressure introduction means is higher than a predetermined leakage reference value.

4. (Twice Amended) A leakage determination method for an evaporative fuel processing system that causes a canister to absorb evaporative fuel generated from a fuel tank and supplies the evaporative fuel absorbed in the canister to an intake system of an internal combustion engine,

the leakage determination method comprising:

a pressure detection step of detecting pressure within the evaporative fuel processing system;

a pressure reduction step of reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a [first] predetermined negative pressure, by introducing negative pressure from the intake system;

a negative pressure introduction step of [further reducing the pressure within the evaporative fuel processing system until the detected pressure becomes equal to a second predetermined negative pressure lower than said first predetermined negative pressure, by] introducing the negative pressure from the intake system <u>into the evaporative fuel processing system</u> under predetermined conditions after the pressure reduction at the pressure reduction step <u>in order to further reduce the pressure within the evaporative fuel processing system</u>; and

a leakage determination step of determining that there is a leak in the evaporative fuel processing system when the detected pressure detected during the introduction of the negative pressure from the intake system is higher than a predetermined leakage reference value.